are certain common features that are independent of the particular vessel, which are discussed in the following. Common features involve placement of the catheter tip in the vicinity of a legion with thrombus. If appropriate for the particular embodiment of the catheter, the tip can then be converted from a delivery configuration to a curved configuration. Once the catheter tip is at a desired position, suction can be initiated. The guide structure may or may not be removed after positioning the catheter, and the selection of an appropriate procedure may be influenced by the design of the catheter and/or the use of ancillary medical devices. The catheter can be moved to remove thrombus from a swept region. In some embodiments, it is desirable to move the catheter in an upstream direction, which generally corresponds with a distal to proximal direction for common placements of the catheter in most procedures. While it is generally desirable to use the thrombectomy catheter in a less invasive procedure, the vessel can be exposed for entry in a surgical procedure in some embodiments. Three specific applications are described in more detail below to further illustrate features of the methodology.

[0129] As noted above, particular thrombectomy catheters are generally intended for use in vessels over a range of sizes. To ensure that the thrombectomy catheters have a suction port adjacent the vessel wall, the deflection distance "D" is generally selected to be larger than the largest vessel diameters selected for use with the particular catheter. Thus, the vessel walls deflect the catheter into a strained configuration with a suction port at or near the vessel wall depending on the location of the suction port in relation to the curves of the tip portion. Such deflection is depicted in FIG. **20**. In the left portion of FIG. **20**, the un-deflected tip portion **370** is depicted. In the right portion of FIG. **20**, tip portion **370** is shown in a strained, deflected configuration within vessel **372**.

[0130] While the tip portion is shown in FIG. **20** with a suction port at the distal end of the catheter, similar deflection takes place with a side port. Suction ports at the distal end of the catheter may then be essentially in contact with the vessel wall. Side suction ports may or may not be essentially in contact with the vessel wall depending on the positioning of the suction port relative to the curves of the tip portion. In general, the suction port can be within 10 percent of the vessel diameter of the vessel wall, in other embodiments within about 5 percent of the vessel diameter of the vessel and in further embodiments within about 2 percent of the vessel diameter of the vessel wall. A person of ordinary skill in the art will recognize that additional ranges of suction port positioning within the explicit ranges above are contemplated and are within the present disclosure.

[0131] Referring to FIG. **21**, vessel **400** has a guidewire **402** extending from a guide catheter **404**. Vessel **400** has a lesion **406** with thrombus/debris. As shown in FIG. **22**, thrombectomy catheter **408** can be brought into the vessel along guidewire **402**. Referring to FIG. **23**, the tip **410** of thrombectomy catheter **408** is inserted past lesion **406**. As shown in FIGS. **22-25**, thrombectomy catheter **408** has a structure corresponding to the catheter in FIGS. **6-8**. Guidewire **404** can be withdrawn to release the tip to its suction configuration, and the guidewire can then be extended outward again as shown in FIG. **24**, although alternatively the guidewire can be removed from the patient. Thrombectomy catheters with alternative tip designs can be used similarly, and the tip can be correspondingly positioned in a curved configuration unless the catheter design does not have a delivery configuration.

[0132] Referring to FIG. **25**, suction is used to remove thrombus from lesion **406** through catheter **408**. Dislodged thrombus (emboli) **412** is depicted within the catheter following removal through the suction lumen **414**. The catheter tip **410** can be moved longitudinally along a selected length of vessel **400** as well as circumferentially around the inner circumference of the vessel. Suction can be applied until the desired sections of the vessel interior have been subjected to suction. Referring to FIG. **26**, a treatment device **420**, such as a stent or angioplasty balloon, is being applied at lesion **406** following completion of the suction process and removal of thrombectomy catheter **408**.

[0133] In general, suction can be initiated at a selected time to achieve desired objectives for the particular patient. Also, suction can be applied continuously or intermittently. For example, suction can be initiated at a selected time once the catheter tip has cleared the guide catheter. In some embodiments with a delivery configuration, suction can optionally be initiated before transitioning the catheter tip to a curved configuration. For example, with a more extensive lesion, it may be desired to apply some suction with a straighter tip configuration before subsequently curving the tip to a curved configuration.

[0134] The suction is contrary to the flow within the vessel. In general, the suction rate can be greater than the flow within the vessel or some fraction of the flow. Specifically, the suction rate can be no more than about 125 percent of the vessel flow, in further embodiments, no more than about 110 percent of the vessel flow, in further embodiments from about 25 percent to about 100 percent and in additional embodiments from about 50 percent to about 80 percent of the unrestricted flow through the vessel. As a particular example, if the unrestricted flow through a coronary artery is 100 milliliters (ml) per minute, the suction rate can be 125 percent of the flow or 125 ml per minute or in further embodiments from about 50 ml to about 90 ml per minute. A person of ordinary skill in the art will recognize that additional ranges of flow rates and flow percentages are contemplated and are within the present disclosure. For syringe based suction embodiments, the size of the syringe can be selected based on the flow in the vessel. Thus, a syringe can be filled in roughly 10 to 30 seconds, for example, for any sized vessel. Multiple syringes can be filled to generate a desired degree of suction.

[0135] Various approaches can be used to move the catheter tip along the desired portions of the vessel wall. For example, the catheter tip can be moved longitudinally along a selected path and rotated to a different orientation along the circumference of the vessel wall and then moved longitudinally again. This can be repeated as desired. In some embodiments, the catheter tip is moved circumferentially around the vessel inner wall, then moved longitudinally to position the catheter tip at another transverse position where it is moved circumferentially again, and the process is repeated until the desired section of the vessel has been treated. In some embodiments, the circumferential and longitudinal motions are coupled to combine into a spiral motion. Selected combinations of motion can be use to yield